

"4. *Hæmulon flavolineatum*.—Ground-colour changing from pale yellow to deep bronze, with numerous undulating stripes of a blue of varying intensity. Two blackish longitudinal stripes, the lower ending in a spot at the base of the caudal fin, suddenly appeared and disappeared. Similarly, a few irregular broad blackish cross-bars could be turned on and off."

Mr. E. G. B. Meade-Waldo, F.Z.S., read extracts from a letter he had received from Dr. Einar Lönnberg, C.M.Z.S., on the hunting of the Sea-Elephant on South Georgia, and called attention to the necessity of steps being taken to prevent its extermination.

The following papers were read :—

1. The Fauna of the Cocos-Keeling Atoll, collected by F. Wood Jones. By F. WOOD JONES, B.Sc., F.Z.S., with the assistance of other Authors.

[Received December 3, 1908.]

(Text-figures 7-9.)

The fauna of the Cocos-Keeling group has been several times investigated, but it has never been thoroughly worked out. The species enumerated in the following lists were collected during a stay of fifteen months in 1905 and 1906, and the collection, of most orders, may fairly be considered as complete.

Darwin visited the group in 1836 and stayed for only ten days, from April the 2nd to the 12th. Wallace in his 'Island Life' quotes Darwin's list of the fauna (p. 275).

Dr. H. O. Forbes visited the islands in 1879, arriving on January 18th, and staying till February 9th, and he amplified considerably the list made by Darwin; unfortunately his collections were lost in returning to Java, and so the additional species that he observed have not been specifically recorded ('A Naturalist's Wanderings in the Eastern Archipelago,' 1885).

On the 20th of August 1885, Mr. W. E. Birch, on behalf of the Straits Government, landed and made inquiries about the islands and their inhabitants; with him, as naturalist, went the Rev. E. C. Spicer. The expedition visited most of the islets, and remained for eight days in the atoll, but in the report (Straits Blue Book 1885) no light is thrown on the condition of the fauna.

In succeeding Blue Books are scattered notes, made by the Commissioners, on some of the most striking features of the atoll fauna, but most of this information is mere interpretation of local legend, and is of no value.

Dr. H. B. Guppy came to the islands in 1888, and has written

an excellent account of their physical features in the Scottish Geographical Magazine (vol. v. 1889, pp. 281, 457 and 569), but he has not, so far as I am aware, published any description of the fauna.

Since the atoll lies 12 degrees south of the Equator, it is of necessity subjected to some seasonal variations, and though these are greatly moderated by the influence of the South-East trade winds, they are sufficiently pronounced to affect the time of appearance of most of the insect fauna. It is therefore obvious, that a stay of a few days could not produce, even with the most industrious collecting, at all a representative series of the insect fauna. The present list need not therefore be taken as indicating that a great increase has taken place in the fauna within the past thirty years, for it is more properly an index of more protracted collecting at all seasons of the year's cycle.

The atoll consists of some two dozen typical "low" islands, that rise but a few feet above mean tide-level, and enclose a lagoon some 8 miles in diameter. The whole group lies at 12° 10' S., 96° 52' E.; and is separated by upwards of six hundred miles from Java, and upwards of five hundred from Christmas Island, its nearest neighbour.

In 1827 the atoll was settled by the pioneer member of the Clunies-Ross family, and ever since that time the destinies of the group have been swayed by three generations of the same family. The islands were uninhabited before the advent of the Clunies-Ross dynasty. In 1901 a Telegraph-station was erected on Pulu tikus, for the working of the cable between Perth (Australia) and Mauritius.

The South-East trades blow for some three hundred days each year, and the climate is subject to no sudden changes save infrequent cyclones; the mean temperature is 81° Fahr., and the annual rainfall averages something over 70 inches.

MAMMALIA.

The Rats of the atoll are of some interest, apart from their economical importance. When the original settlers arrived in the group in 1827, rats were already established on one of the islands, and this island was named Pulu tikus, or rat island, in consequence.

From 1827 till 1878 these rats remained as the only representatives of their family, and continued to be almost confined to the island of their settlement. Towards the end of 1878 a ship, 'The Robert Portner,' was wrecked in the atoll, and left as her legacy a flourishing colony of *Mus decumanus*; since then other wrecks, and trade intercourse, have added *Mus rattus* to the island fauna. The products of these separate invasions have remained distinct until to-day, and they have fairly sharply defined areas of distribution. The "original rat," as it is called, remains confined to Pulu tikus. *Mus decumanus* is most abundant on

Pulu Selma, and some of the smaller islands to the south. *Mus rattus* has its stronghold on Pulu gangsa, where it is very abundant, but it also occurs on the other islands in company with *M. decumanus*. When Dr. H. O. Forbes visited the atoll in 1879, he noted the great number of rats—these were the ‘Robert Portner rats’ that had invaded the islands in the previous year, and had multiplied to an extraordinary extent. He makes no note of the black rats, and does not mention the race of ‘original rats’ on Pulu tikus.

During Darwin’s visit the only rat in the islands was this Pulu tikus race, and of it he says:—“These rats are considered by Mr. Waterhouse as identical with the English kind, but they are smaller and more brightly coloured” (‘Naturalist’s Voyage,’ p. 461); and Wallace (‘Island Life,’ p. 275) adds, “We have here an illustration of how soon a difference of race is established under a constant and uniform difference of conditions.”

In the seventy years that have passed since Mr. Waterhouse described the rat, the difference appears to have become more marked, and a description of the race is justified for the reason that the modern introduction of rat virus into the atoll may easily exterminate it.

External appearance.—The rat is a slenderly built and sleek looking animal; its general colour is a warm russet-brown. The fur of the back is coarser, and some hairs stand out that are almost black, and are 30 mm. in length; these long dark hairs are more numerous over the hind end of the body than over the shoulders. The general colour of the body is a rather rich brown, the belly being but little lighter than the back in most specimens. The shorter hairs are grey at the base and bright red-brown at the tips; the longer hairs are dark brown to black. The fore limbs are somewhat lighter than the rest of the body, but the hind limbs are of the general rich red-brown. The under surface is only slightly lighter than the back, and is a light warm brown, not grey; the chin and throat are somewhat lighter. The under surface of the scrotum of the male is covered with long bright red-brown hairs, brighter than those of any other part of the body; the distal extremity of the scrotum is bald, the naked skin being a dark purplish brown.

The vibrissæ—many of them more than 60 mm. long—are numerous and dark-coloured. The ears are almost naked, they are oval and prominent and average 22 by 15 mm. The hind feet are large and long, their soles are dark, almost purple, coloured; the digits are slender, the claws are long and much curved. The tail very slightly exceeds the length of the head and body, it is darker than the body colour; it is finely scaled, 12 rows to the centimetre, and sprinkled with numerous fine black hairs. There are two pairs of pectoral mammae, and three inguinal pairs, 2-3=10. The tibiae are almost straight, having practically no “bow” forwards.

The Skull.—The skull is long and narrow, and is delicately

built. The nasals extend posteriorly to the anterior margin of the orbit, are 15.5 mm. long, and 2.8 mm. wide at their broadest part. Basal length of skull 35-38 mm.; greatest breadth 18 mm. Interorbital constriction, least breadth 6 mm. Interparietal, length 5 mm., breadth 10 mm. Length of base of anterior root of zygoma 6 mm. Palate, length 20 mm.; breadth, outside m^1 9 mm., inside m^1 4 mm. Palatine foramina 8 mm., *extending 1 mm. behind the anterior edge of m^1* —this is a constant feature. Alveoli (back of incisors to m^1) 12 mm. Upper molar series 6.5 mm. Incisors pale yellow in the lower jaw, orange in the upper jaw.

The measurements in millimetres of a series of specimens are as follows:—

	Head and Body.	Tail.	Hind foot.	Leg (tibia).	Front foot.	Forearm.	Sex.
1...	190	190	40	50	20	35	♂
2...	207	208	40	45	20	33	♂
3...	195	200	40	50	20	30	♂
4...	195	191	38	42	22	25	♂
5...	205	215	40	52	19	34	♂
6...	187	185	40	50	18	32	♂
7...	192	215	40	50	19	34	♂
8...	200	205	40	45	20	30	♂
9...	180	185	40	45	20	30	♂
10...	163	158	39	40	22	29	♂
11...	150	155	38	39	22	27	♂
12...	147	149	36	38	18	24	♂
13...	215	230	42	45	22	36	♂
14...	198	202	39	48	20	32	♂
15...	187	190	39	48	18	32	♂
16...	170	160	35	42	20	38	♂
17...	120	130	35	35	17	32	♂

Habits.—The rat is very abundant on Pulu tikus, and although it has been steadily trapped, and hunted by dogs, for the last four years, it does not appear to diminish in numbers. As many as forty will still be taken in wire traps beneath the Telegraph quarters in a night, and outside the little area of the station the rat swarms everywhere. It is by no means a house rat, and although it is common in and around the houses it is still more abundant in the outlying parts of the island. It is splendidly adapted to its environment; it has altogether given up burrowing, and it lives in the piles of coconut husks and in the crowns of the palms. It is certain that, at times, the young are born at the tops of the palms, which are 60 to 70 feet high. The rats ascend the trees with the greatest ease, and they run from one palm to the next, across the interlacing fronds, very much after the fashion of the squirrel. They are by no means strictly nocturnal, doubtless from their long freedom from any enemies, and they are to be seen running about at all times of the day. They feed almost entirely upon the fallen coconuts, and all the nuts that I have ever seen opened

have been gnawed by rats, and not torn open by *Birgus latro*, as they are often said to be. Even those that are trapped around the Telegraph quarters are almost invariably full of coconut, and most come into the houses to obtain water rather than for food. Before the Telegraph-station was built no water was available, save that collected during showers in the bases of the palm-leaves. It has been killed in vast numbers since the opening of the Telegraph-station on Pulu tikus in 1901, but its numbers do not seem to have diminished at all. Considering its extreme abundance it does very little harm, save eating the copra stored on the island, and it has never adopted the practice of nibbling the green nut, that makes the rats on the other islands such an economical curse.

Mus decumanus, typ.—This is the pest of the atoll, and does incalculable damage to the coconut plantations. A perpetual war is waged against it by means of traps and dogs; natives are specially told off for the purpose of rat killing, and all the dead rats are regularly recorded. Apart from eating copra, and damaging stores, it has learned to climb the palms, and destroys countless nuts by nibbling them through, just where the stalk joins the husk. It is known in the islands as the 'New' or 'Norwegian' rat, and is always distinguished by the natives from the Pulu tikus rat.

Mus rattus, typ.—Is common on Pulu gangsa and some of the small southern islets, and I have had one specimen from Pulu Selma, where it is not nearly so common as *M. decumanus*. It does not exist in such numbers as does *M. decumanus*, but it has learned the same destructive habits. It is never met with on Pulu tikus.

Mus musculus Linn.—By no means abundant, although for a few months in 1905 it became very common in Pulu tikus; on that island it does not appear to have been seen in any numbers until about 1903, and it was doubtless introduced with stores from Singapore.

A herd of feral deer lived for long in Pulu luar. The animals were introduced from Java and from Singapore, and consisted of two species, the Sambar (*Cervus hippelaphus*) and the Kedang (*Cervus muntjac*). All were dead when I left the islands in 1906, and the only trace of their presence was a well-marked "browse limit" to the trees, a novel feature in a coral-island landscape.

Waifs and strays include bats of some small species that did not appear during my stay in the atoll, and that are said to be the *Pipistrellus murrayi* Andrews, from Christmas Island. A large monkey is also said to have been washed ashore, and to have long survived in the islands; the method of its advent is not known.

The domesticated animals include dogs, cats, and pigs; sheep have been turned down, with but little success; and rabbits liberated on Pulu luar do not seem to have multiplied greatly.

AVES.

COLUBRIFORMES.

(1) CARPOPHAGA WHARTONI Sharpe.

Native name, "Pergám."

Introduced from Christmas Island, but now (1906) practically extinct in the atoll.

RALLIFORMES.

(2) RALLUS PHILIPPENSIS Linn.

Native name, "Ayam utan."

Very abundant on all the islands, and is everywhere very tame, it being a matter of some difficulty to make it take wing. It feeds on the shore when the tide is out, but it may also be seen perched high in papia trees eating the ripe fruit, and it has a bad name for eating the eggs of domestic fowls. It nests in September, in tufts of grass, about a foot from the ground; it lays from two to six eggs, very like the English Corncrake's. The young are all black when hatched, and can run directly they are out of the egg. The call-note is a shrill grating sound, and in the breeding-season the cock adds a deep croak not unlike the noise made by frogs. This species is not found in Christmas Island.

LARIFORMES.

(3) STERNA FULIGINOSA Gmel.

Native name, "Burung dali."

Breeds in Keeling Island but not in very great numbers. It keeps very much to itself on the breeding grounds, and lays one egg in the sand above the beach rise, on the western side of the island. By sailors it is called the whale-bird. Although not uncommon, and often seen at sea, far from the atoll, it does not occur on Christmas Island.

(4) ANOUS STOLIDUS Linn.

Native name, "Burung krok."

Not resident in the Southern atoll, but a frequent visitor to the lagoon. In Keeling atoll it breeds in great numbers. In June the breeding-season has almost come to an end. The nests are made about a foot above the ground, on little collections of sea-tossed wrack. In the atoll all the "noddies" build close together in a rather limited area. Only one egg was found in each nest.

(5) GYGIS CANDIDA Wagler, Isis, 1832, p. 1223.

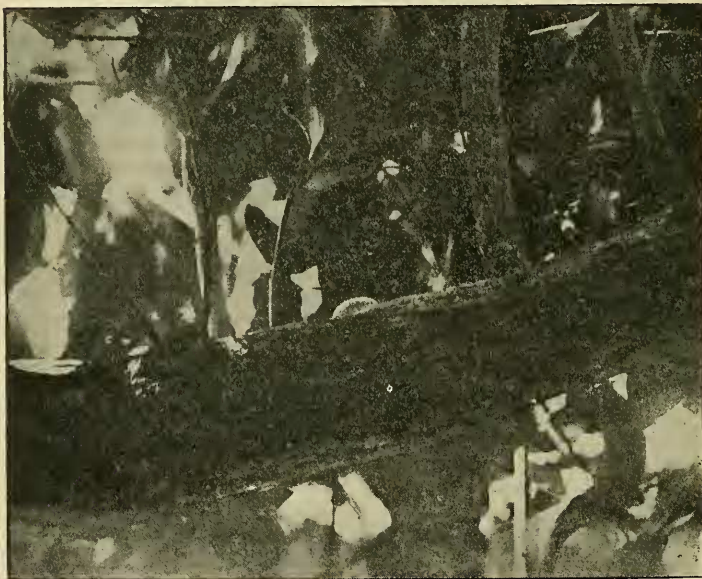
Native name, "Burung chuit-chuit" (onomatopœic).

Darwin noted the bird in 1836 ('Naturalist's Voyage,' p. 462), and H. O. Forbes gave an account of it in 1879 ('Naturalist's Wanderings,' p. 34). The bird agrees with the description of

Wagler :—"Irides nigro-cœruleæ; rostrum nigrum, basi cœruleum; lingua sublata rostro brevior; pedes cœrulei, palma alba, ungues nigri."

In a good description of this bird (Cassin, U. S. Explor. Exped. p. 389) the feet are said to be "pale blue, having a deeply indented yellow membrane." In Gould's 'Birds of Australia,' vol. vii., the feet are described as orange, and are figured of that colour in the accompanying plate. In other accounts it is stated that the feet are yellow or brown. The bird, as I have seen it in the Cocos-Keeling group, invariably has the feet entirely blue, the web being slightly lighter than the toes.

Text-fig. 7.



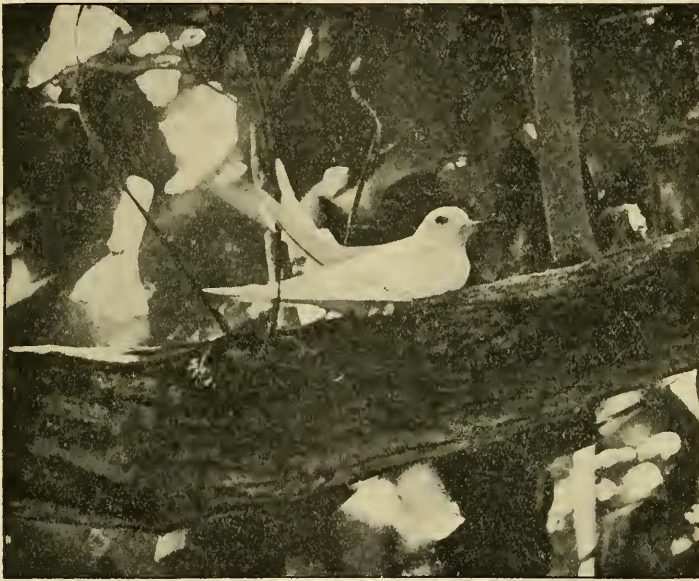
Egg of *Gygis candida*, laid on the branch of a grongong tree (*Cordia subcordata*).

The bird is a common one, and occurs in all the islands. It breeds in the Southern group as well as in Keeling Island.

Although the bird feeds mostly on fish, it may often be seen hovering around the papaia-trees and eating the soft fruit. It is quite arboreal in its habits, and its one egg is laid sometimes at a height of 40 feet from the ground. Most of the eggs were found in September, but on visiting Keeling Island in June two eggs were found after very little searching. The egg is almost perfectly oval (40-43 mm. in its long axis, 21-22 mm. in its short axis); it is

cream-coloured, mottled and streaked with olive-brown. It is laid on the branch of a tree (*Pisonia inermis*, *Cordia subcordata*, *Guettarda speciosa*) wherever a slight irregularity in the bark suffices to hold it steady (see text-fig. 7). In all the cases that I have seen the egg was laid in the long axis of the branch, and the parent bird sits across the branch in the process of incubation. From the fact that three nesting sites were used twice over, it would seem as though the suitable branches for balancing the egg were somewhat limited. The birds take it in turn to sit, or rather stand, on the egg, and they invariably leave it by falling backwards

Text-fig. 8.



Gygis candida sitting on its egg.

This is the same egg as is shown in text-fig. 7.

off the branch, in order not to disturb it with their feet; great caution is taken in getting into position on the egg again (see text-fig. 8). Incubation lasts 36 days; the newly hatched young is buff-brown, and it does not move from the tree until it has assumed its white feathers. A bird hatched on Sept. 3rd, 1905, did not move from the site of its hatching till Oct. 22nd; it then moved higher up the branch, and remained, with slight changes of position, till Nov. 12th, when it took its first flight (see text-fig. 9, p. 142). Many eggs were watched and in no case did any accident befall them, but a young bird, hatched on Nov. 17th, fell from its insecure

position on the fourth day, and was killed. This bird does not occur on Christmas Island, and is not seen far from the atoll—it is, in fact, a sign that the atoll is near when one is seen on the voyage from Java.

ARDEIFORMES.

(6) DEMIEGRETTE SACRA Sharpe.

Native name, "Blakok."

Exists in fair numbers, especially in Pulu atas, where as many as twenty may be seen fishing together. Birds in the white phase and in the grey phase mix freely together; though it is said in the islands that white pair with white, and grey with grey. The nest is made in the Pisonia trees, and two pale blue eggs are laid. I obtained specimens in January.

In Pulu atas I have also seen a solitary individual of a larger species of Heron, that, in the distance, appears to be pure white; this individual was well known to the natives of the atoll.

PELECANIFORMES.

Suborder FREGATI.

(7) FREGATA AQUILA Linn.

Native name, "Burung itam."

Does not breed in the main atoll, but nests in large numbers in Keeling Island. The nest is a slight collection of twigs, stolen from the nesting Gannets, and placed on the flat tops of the Pemphis bushes. The nests are crowded together in thousands; one egg only is laid, which is pure white and its surface is shining; eggs were abundant in June. The bird is so tame in Keeling that it has to be driven from the egg, and those birds that are sitting in the hot sun, with their wings half spread, may easily be approached and lifted from the ground.

(8) FREGATA ARIEL Gould.

This species is more common than the last. Its habits are similar, and it nests freely with the larger species. It is also called Burung itam by the natives.

Suborder SULÆ.

(9) SULA SULA Linn.

Native name, "Burung bebek."

I have never seen this bird in the main atoll, and its numbers are somewhat limited in Keeling Island. It lays one or two dirty white eggs on the bare ground, at the top of the western sand-beaches.

(10) SULA ABBOTTI Ridgw.

Native name, "Burung gangsa."

Is not common in Keeling, and, so far as I have observed, does

not come to the Southern group. The face is black, and the bird is considerably larger than the other two species. One or two eggs are laid on the bare ground. The black mask gives the sitting bird a very curious appearance, and it leaves its egg only after having, with great solemnity, vomited large quantities of fish; it makes no attempt to resist being pushed from the egg, and when the egg is taken, and the fish has been vomited, it quietly walks away. No skin was obtained.

(11) *SULA PISCATRIX* Linn.

Native name, "Burung main main."

The commonest of the three species, and generally called "Booby" by sailors in these seas. Exists in very great numbers, and is seen in all the many age changes of plumage, from a uniform light brown to white. It lays one egg, in a nest placed, as a rule, high up in trees; but numbers build on Pemphis bushes in Keeling. The birds commonly perch on trees, and are often taken from the rigging of ships.

Suborder PHAETHONTES.

(12) *PHAETHON RUBRICAUDA* Bodd.

Native name, "Burung buntut."

Does not exist in great numbers, but still breeds in Pulu atas. This species, as well as *P. fulvus*, is to be seen everywhere between the atoll and Java Heads.

PASSERIFORMES.

Fam. PLOCEIDÆ.

Mr. H. O. Forbes mentions *Ploceus hypoxanthus* as one of the nesting species of the atoll; but no examples of it exist to-day.

(13) *MUNIA ORYZIVORA* Bp.

Native name, "Burung glatek."

Introduced, and has multiplied greatly; it is now one of the commonest birds of the atoll.

Fam. TURDIDÆ.

(14) *MERULA ERYTHROPLEURA* Lister.

Introduced from Christmas Island, and now very common, especially on Pulu tikus. The bird is remarkably tame, coming freely into rooms to obtain water. Has a rather pleasing song, which it utters in September and October. The nest is built in November, and the egg is very like that of the European Redwing.

Fam. ZOSTEROPIDÆ.

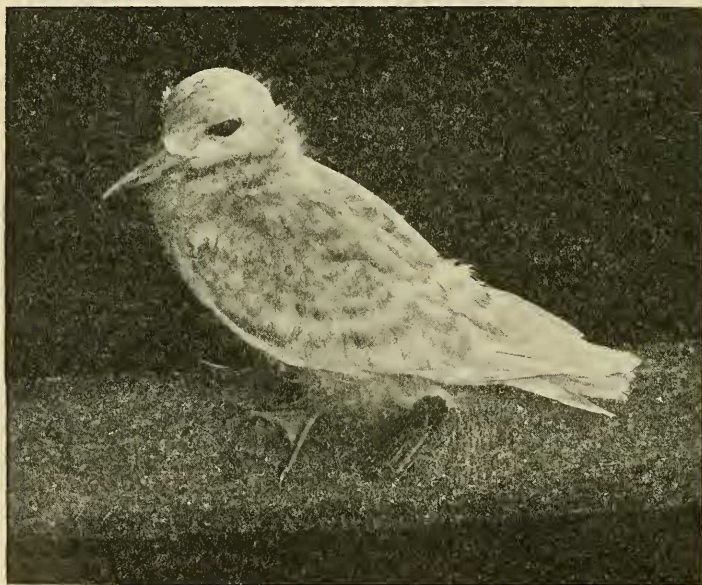
(15) *ZOSTEROPS NATALIS* Lister.

Introduced from Christmas Island. Confined to Pulu luar, where it exists in some numbers. In Christmas Island it is

known as Burung Waringin, but in Cocos-Keeling it has earned the name of Burung chinta or "love-bird."

"Golden plover," native name "Burung blebis," and "Curlew," are said to breed on some of the islands, but I never found the eggs, nor did I ever obtain a bird for identification. A flock of ducks is resident on Pulu panjang, and on the same island I have seen many small waders, but the wise policy of the islands is that these birds shall not be interfered with, and I cannot name the species. I have, however, shot a stray Snipe (*Scolopax gallinago* Linn.) from a small flock on Pulu tikus, and on the same island obtained a Swallow, *Hirundo gutturalis* Scop. These are the only visitors that came to the islands in my stay of fifteen months, and the atoll would seem to be altogether out of the track of any, save very wind-blown, migrants.*

Text-fig. 9.



Young *Gygis candida*, soon about to take its first flight ; the plumage is still mottled with buff-coloured feathers.

* In North Keeling atollon are large warrens, the nesting sites of "Mutton Birds"; during my visit to the atollon these birds were not present, but they evidently visit the place, for the purpose of breeding, in very large numbers.

In all probability they are *Puffinus brevicaudus* or *P. sphenurus*.

REPTILIA.

Species determined by G. A. BOULENGER, F.R.S., V.P.Z.S.

(A) LACERTILIA.

Fam. GECKONIDÆ.

(1) LEPIDODACTYLUS LUGUSTRIS D. & B.

Native name, "Cheechak."

A very abundant species, inhabiting dwelling houses, and also living beneath the loose bark of coconut palms. Six or seven eggs are laid at a time—as a rule beneath some convenient chink of bark. It has the characteristic voice of its family, which has given rise to its name.

(2) GEHYRA MUTILATA Wiegman.

Not nearly so common as the first species, and lives exclusively out of doors, being always found beneath the bark of the coconut palms. It is at once distinguished from No. 1 by its flattened tail. It lays from three to four eggs, and the incubation period is as long as two months (June to August).

(B) OPHIDIA.

Fam. TYPHLOPIDÆ.

(3) TYPHLOPS BRAMINUS Daud.

Native name, "Ular minyah."

This is not a common species in the islands, and its habits lead to its being very rarely seen. It is most commonly found beneath large coral boulders, and it is extremely active. It is found on practically all the islands in the atoll. The average length is 150 millimetres.

None of these species is found in Christmas Island.

(C) CHELONIA.

Two species of Turtles are frequently speared in the lagoon. They are *Chelone imbricata* L., native name "Pinnew sisih," and *C. mydas* L., native name "Pinnew betul." Both have ceased to use the main atoll as a breeding place, for the native demand for them is too great; but on Keeling atollon their nests are common on the sandy beaches.

Accidental visitors.—From time to time other reptiles have been washed ashore. Several large snakes have floated to the islands, and have been picked up dead, or dying, on the beaches. Some few have survived the journey, but none has made a successful footing. At least two crocodiles have survived the six hundred miles of ocean travel: one was shot by the Governor, and one, after being repeatedly seen, disappeared after a cyclone.

PISCES.

The fish of the group were not collected, but no doubt a rich harvest awaits the investigator of the myriad smaller coral-haunting species. The native names of those that are of the most economical importance only are given here; and no specific determination is possible in most cases.

(1) Ikan babi = pig fish, *Balistes* sp. (2) Ikan buntal = inflated fish, *Tetrodon patoca*. (3) Ikan buntal besagi = square-shaped inflated fish, *Tetrodon* sp. (4) Ikan blana. (5, 6) Ikan bandang and Ikan bandang laut. (7) Ikan buntut burih = spotted tail. (8) Ikan chuchut, generic name for the numerous Sharks. (9) Ikan dongol, *Scarus* sp., grows to a great size. (10) Ikan grâpu. (11) Ikan iju = green-fish, *Pseudoscarus* sp. (12) Ikan jengot = bearded fish. (13) Ikan jengot karang (karang = coral). (14) Ikan kakap. (15) Ikan kakap kuning = yellow kakap. (16) Ikan kakatua iju, *Scarus* sp. (17) Ikan kakatua merah = red kakatua, also a *Scarus*. (18) Ikan merah = red fish. (19) Ikan malam = night fish. (20) Ikan menyrat. (21) Ikan padang döeh, the albicore. (22) Ikan p'dang, *Histiophorus gladius*. (23) Ikan pareh, *Dicerobatis eregoodoo*, grows to a great size, being upwards of 13 feet across the back. (24, 25) Ikan peteh, and Ikan peteh kuning. (26) Ikan puti = white fish. (27) Ikan palo. (28) Ikan sambar. (29) Ikan samsi. (30) Ikan skagnol. (31) Ikan talam talam. (32) Ikan talang. (33) Ikan tangiri, the king fish. (34) Ikan todak, the baracouta. (35) Ikan trompet.

It is to be hoped that, with the free communication that the Telegraph-station affords, some attempt may be made to get together a collection of the fish of the atoll: and for the purpose of assisting any collector, this incomplete list of the native names is published.

LEPIDOPTERA.

LEPIDOPTERA RHOPALOCERA.

(Native family name, "Kupu kupu.")

Species determined by Mr. F. A. HERON.

(1) *PRECIS VILLIDA* Fabr.

This is the commonest butterfly in the atoll. It is most abundant in July and September, and again in March and April. The larva is black, and is covered with spines: food-plant is *Asystasia coromandeliana*. The pupa is suspended by the tail from the branches of its food-plant, it is mottled brown and has no metallic markings. The pupal stage lasts for a fortnight or three weeks.

(2) *HYPOLYMNAS BOLINA* Linn.

(3) *HYPOLIMNAS BOLINA* form *NERINA* Fabr.

An uncommon species, on the wing in April and August. Specimens are in perfect condition, and the species is evidently resident.

(4) *HYPOLIMNAS MISIPPUS* Linn.

A common species on all the islands of the group. One worn specimen was taken on Christmas Island by Dr. Andrews. The males and females of this species are very rarely seen together; the males flying high in the shade of the thickly growing coco-palms, and the female being generally seen flying low over the herbage in open spaces. It is abundant from July to October, and again from the end of February to April. The larva is brown and spiny, the head is reddish and bears two spines. It feeds on a succulent weed that grows all over the open spaces in the atoll. The pupa is brown and has no metallic markings; it is suspended by the tail. Six days are passed in the pupal stage. The female mimics *Danaïs* (*Limnas*) *chrysippus petilia* Stoll, and is nearly always seen flying in company with that species, whose habits of fluttering over the herbage it has closely imitated. The male, on the other hand, flies strongly and is not often seen fluttering near to the ground.

(5) *VANESSA KERSHAWI* McCoy. (Australian.)

Only four examples of this species were met with in fifteen months, and since all were observed between the 15th and 17th of May 1906, it is probable that they were waifs. Two rather worn specimens only were captured on Pulu tikus.

(6) *DANAIS* (*LIMNAS*) *CHRYSIPPUS PETILIA* Stoll. (Australian & Christmas Id.)

Common on Pulu luar and Pulu tikus, but not so often met with on the other islands. The larva is pale green, banded with yellow and black. The food-plant is *Asclepias curassavica*. The pupa is suspended by the tail, and is pale green or buff with small golden dots. The average stay in the pupa is only 135 hours.

LEPIDOPTERA HETEROCERA.

Species determined by Sir GEORGE F. HAMPSON, Bt., F.Z.S.

ARCTIADÆ.

(1) *UTETHESA PULCHELLOIDES* Hampson.

A very abundant insect on all the islands. It mostly frequents the seaward side, for there the food-plant, *Tournefortia argentea* Linn., lives most luxuriantly. The perfect insect, and the larvæ, are to be seen at all times of the year, and season appears to make no difference to its numbers.

NOCTUIDÆ.

(2) *CHLORIDEA OBSOLETA* Fabr.

No specimens were taken during 1905, and the insect only became at all plentiful in June 1906.

(3) *CHLORIDEA ASSULTA* Guen.

Appeared at the same time as the last species, and was not seen in any numbers.

(4) *CIRPHIS LOREYI* Dup.

Not an abundant insect, and strictly confined to a seasonal appearance. Taken in June 1905 and not again until the same month in 1906.

(5) *PRODENIA LITTORALIS* Boisd.

Abundant on all the islands, on the wing most plentifully in May and June. The larva feeds on a multitude of low-growing plants. This very widely distributed species is found on Christmas Island.

(6) *SPODOPTERA MAURITIA* Boisd.

Several specimens were taken in June 1905, but in June 1906 it did not appear again.

(7) *LEOCYMA SERICEATA* Hmps.

Not abundant, appears in June and again in November. The larva is pale green and bears a few scattered hairs, it feeds on the leaves of the Waroo (*Hibiscus tiliaceus* Linn.). Not on Christmas Island, though its genus is represented by *L. tibialis* Fabr.

(8) *OPHIUSA CORONATA* Fabr.

Only one specimen taken, and a few more seen, in June 1905. Occurs on Christmas Island.

(9) *OPHIUSA MELICERTA* Dru.

This is one of the most plentiful of the atoll insects, being found wherever the bushes of *Pemphis acidula* (native name "Kayu burung") are growing. It is on the wing practically all the year round, but is most common from June to September. The larva bears a wonderful resemblance to the twigs of the *Pemphis acidula* or the *Ricinus* on which it feeds. It has a habit of dropping from its twig when disturbed, but it always manages to get a fresh hold of a lower twig, on the way down, although it appears to be falling to the earth. It pupates in a few leaves spun together at the ends of the twigs; the pupa is covered with a fine bloom. Fourteen days are passed in the pupal state.

(10) *REMIGIA FRUGALIS* Fabr.

Most abundant in May, and a few stragglers again in September. It flies by day, and is not uncommon in the grassy spaces, where the undergrowth is kept cleared.

(11) *PLUSIA CHALYCTES* Esp.

The development of a garden on Pulu tikus appeared to be the cause of the abundance of this species; but since the garden plants were introduced as seed, there appears but little chance of their having been the agent for its introduction. It swarmed in June 1906, and the green larva was abundant on peas, tomatoes, and almost every plant that was grown in the garden. The pupal stage lasts only a week.

(12) *HYPENA STRIGATA* Fabr.

One example only taken.

(13) *CATEPTRIA* sp.

This is a handsome insect, boldly marked with black and white. It appears on the wing in September. The larva feeds on the leaves of *Pemphis acidula*, in company with *Ophiusa melicerta*, to which larvæ it bears a considerable rough resemblance. It is mottled grey on the back, and the belly is velvety black; at the anal extremity is an upwardly directed tubercle with a bifid tip. A collar of magenta colour surrounds the larva behind the head, but in all ordinary attitudes this is hidden by a skin-fold. It pupates among the little leaves of its food-plant; the pupa has no bloom, and the pupal stage lasts for twenty days. I never saw an example of the perfect insect, save those that I reared from larvæ; and, so far as I could find out, no one on the island was acquainted with the moth. The larvæ were by no means uncommon on a few bushes in Pulu tikus, but I did not meet with them on any other islands.

SPHINGIDÆ.

(14) *MACROGLOSSA PASSALUS* Dru.

By no means common, and more frequently seen as a larva than as an imago. On the wing in September. Larva green with fine bright pink side-stripes; feeds on *Morinda citrifolia* Linn., native name "Mungkoodoo." The pupa is a mottled yellowish-brown.

(15) *CEPHONODES HYLAS* Linn.

Common on Pulu tikus, but not often seen on the southern islands. Frequents the flowers of the Papaia by day, and is evidently the source of the error that bees are common in the islets. When hovering in front of the food-plant, in the act of laying its eggs on the leaves, the long hairs of the extremity of the body stand out like a fan. Most abundant in June and September, but stragglers may be taken in almost any month.

Larva feeds on the leaves of *Guettarda speciosa* Linn., native name "Melati." When first hatched they are quite black, and they only become green in their penultimate and ultimate skins. They are subject to endless variation, and if bred in the dark, very striking larvæ, coloured yellow and black, can be produced; the imagines resulting from these larvæ are normal. This insect occurs on Christmas Island.

(16) HERSE CONVULVULI Linn.

Not a very common insect. Found most plentifully on Pulu Selma. The larva is either green or brown, and it feeds on *Convolvulus parviflorus* Vahl. In the atoll this is the moth specially named "Rama rama," although in the Straits that word is the general name for all moths.

(17) CHLROCAMPA VIGIL Guer.

The perfect insect is rarely seen, but the larva is very abundant in September. It feeds on the leaves of *Pisonia inermis* (native name "Ampol"); it is green, but in its last skin it frequently becomes putty-coloured. When fed in the dark the last skin is almost invariably brown. A month is passed in the pupa. This species occurs on Christmas Island.

GEOMETRIDÆ.

(18) CHLOROCLYSTIS TENUILINEA Wair.

Not uncommon in June and August. The larva is green, with darker markings, and is slightly hairy. Feeds on the sticky flowers of *Pisonia*, and pupates among them.

PYRALIDÆ.

(19) PYRALIS MANIHOTALIS Guer.

Not at all plentiful.

(20) MELISSOBLAPTES sp.

Very abundant on all the islands of the group.

(21) ZINCKERNIA FASCIALIS Cram.

Always common. This widely distributed species also occurs on Christmas Island.

(22) MARASMIA VENIHALIS Walk.

One of the commonest insects. Appears in June, and is always to be found about the station lamps.

(23) CROCIDOLOMIA BINOTALIS Zell.

Only a few examples met with in June.

(24) PACHYZANCLA LICARSISALIS Walk.

Abundant from June to August. The larva is green, with

minute black spots; it feeds on the leaves and flowers of *Dicliptera burmanni* Nees. It pupates in the spun-up leaves, and the pupal stage lasts for fourteen days.

(25) *PACHYZANCLA STULTALIS* Walk.

Abundant in June on all the islands.

(26) *GLYPHODES INDICA* Saund.

Not abundant.

PTEROPHORIDÆ.

(27) A brownish coloured Plume is very common in all the islands. The larva feeds on *Boerhavia diffusa* W., which grows everywhere in the atoll.

TINEINÆ.

(28) The solitary species collected was a very common one; there are probably at least two others that are distinct.

There are therefore practically thirty species of Heterocera on the Cocos-Keeling atoll, and there are more than twice as many species in the fauna of Christmas Island; yet only five, very widely distributed species, are common to the two places.

HYMENOPTERA.

Species determined by the late Col. C. T. BINGHAM, F.Z.S.

FORMICIDÆ.

(Native family name, "Samut.")

(1) *ODONTOMACHUS HEMATODES* Linn. ♀.

(2) *PLAGIOLEPIS LONGIPES* Jerdon. ♀.

Unfortunately this does not represent the whole of the species of ants found on the atoll. The natives distinguish at least three species:—(1) "Samut saman"; (2) "Samut arpi"; (3) "Samut alus." The other representatives of the family are unfortunately mislaid.

FOSSORES.

(3) *STIZUS* sp. (very near *reversus* Smith). ♀.

(4) *PISON HOSPES* Smith. ♂.

(5) *NOTOGONIA SUBTESSELLATA* Smith. ♂ ♀.

None of the Fossores is at all numerous, and only very careful collecting produced the very few specimens obtained in the course of fifteen months.

None of these species is represented in the fauna of Christmas Island.

DIPTERA.

Species determined by E. E. AUSTEN, F.Z.S.

ASILIDÆ.

- (1) *PHILODICUS JAVANUS* Wied.

A common insect of very voracious habits. It is generally seen sitting on the coral boulders, in the hottest sunshine. It lies in wait for smaller diptera, and it will attack and kill even butterflies as large as *Precis villida*.

BOMBYLIDÆ.

- (2) *ANTHRAX* sp. Only a very few examples met with.

DOLICHOPODIDÆ.

- (3) New genus and species (No. I.), near *Psilopus*.

- (4) New genus and species (No. II.), near *Psilopus*.

Both of these are common insects, but owing to their green colour and small size, they are not at all conspicuous. They are shining green flies that are most commonly seen running on the leaves of the *Hibiscus*. They are extremely active, and are generally found during the hottest hours of the day.

MUSCIDÆ.

- (5) *SARCOPHAGA* sp. No. I.

- (6) *SARCOPHAGA* sp. No. II.

Both are common species, frequenting the dead bodies of rats.

- (7) *RHINIA TESTACEA* Rob.-Desv.

Few examples seen, mostly upon the herbage of the seaward side of the islands.

- (8) *PYCNOSOMA FLAVICEPS* Macq.

The commonest fly in the atoll.

- (9) *OPHYRA CHALCOGASTER* Wied.

MICROPEZIDÆ.

- (10) *NERIUS LINEOLATUS* Wied.

HIPPOBOSCIDÆ.

- (11) *PSEUDOLFERSIA SPINIFERA* Leach.

Usually swarming over the plumage of the Frigate-birds. On

Keeling atollon, where these birds breed in thousands, the fly is often seen crawling about the nesting bushes.

CULICIDÆ.

(12) The Mosquito of the islands is a species of *Stegomyia*, and it exists in great numbers.

COLEOPTERA.

Species determined by C. O. WATERHOUSE, P.E.S.; C. J. GAHAN, M.A., F.E.S.; and G. J. ARROW, F.E.S.

BRACHELYTRA.

(1) ALEOCHARA sp. This genus is not represented on Christmas Island.

CLAVICORNIA.

(2) DERMESTES FELINUS Fabr.

A common species, found mostly in the dead bodies of rats. Universal distribution, and common on Christmas Island.

(3) COCCINELLA TRANSVERSALIS Fabr.

A very abundant insect; not present on Christmas Island.

(4) TROCHOIDEUS DESJARDINSI Guer.

Not present on Christmas Island.

LAMELLICORNIA.

(5) ONTHOPHAGUS sp.

Genus not represented on Christmas Island.

(6) ANOMALA sp.

An abundant species that lives on the iron-wood (*Cordia subcordata*). Freely attracted to light and most commonly found in the lamps of the Telegraph-station. Not found on Christmas Island.

(7) POTATIA ACUMINATA.

The largest beetle found on the atoll. It is by no means common, and not more than a dozen specimens were taken in fifteen months. Not present on Christmas Island.

MALACODERMATA.

(8) CORYNETES RUFIPES De Geer.

Native name, "Kutu copra."

The most important insect of the atoll, from an economical point of view. Called by Europeans the "Copra beetle." Exists

in myriads near to the sheds where the copra is stored. It will swarm to anything oily, and was killed in thousands on the refrigerator engines. It is very active, it flies by day, and has a habit of creeping beneath the clothing and biting rather sharply. It does not occur on Christmas Island.

SERRICORNIA.

(9) MEGAPENTHES sp.

Not a common insect. It does not occur on Christmas Island, where *M. andrewsi* Waterh. is the representative of the genus.

(10) MELANOXANTHUS MELANOCEPHALUS Fabr.

One specimen only, flying in the sunshine, on March 2, 1906. Does not occur on Christmas Island, but the genus is represented there by *M. dolosus* Cdz. and *M. litura* Cdz.

HETEROMERA.

(11) OPATRUM sp. (near *simplex* Fabr.).

A common insect, found mostly under the bark of the coconut palms. Does not occur on Christmas Island, where the genus is represented by *O. dubium* Arrow.

(12) CEROPRIA INDUTA Wied.

Very abundant on all the islands. Lives in rotting wood. The genus is not present on Christmas Island.

(13) SESSINIA sp.

Native name, "Madû."

A very common insect. Found on all the islands, and freely attracted to light. It is the subject of great variations in size.

Well known to the inhabitants, Malay and European, as producing an acute dermatitis by contact, and an acute urethritis when swallowed in drinks; for this reason drinks are always carefully covered over to prevent the beetles from falling in. Concerning these properties of the insect there is no doubt, and although I have failed to produce the urethritis by swallowing a decoction of two beetles in a glass of whiskey and soda, I have met with several cases in which its development is definite, and have frequently seen the cutaneous lesions.

This species would appear to be very similar to, if not identical with, *S. andrewsi* Arrow, from Christmas Island; and of that insect Dr. Andrews says that it exudes an oily liquid, "which is considered by the residents to have most injurious properties" ('Monograph of Christmas Island,' p. 107).

LONGICORNIA.

(14) CERESIUM SIMPLEX Gyll.

Rare. Not found on Christmas Island, but two representatives

of the genus—*C. quadrimaculatum* Gahan and *C. nigrum* Gahan—were taken there by Dr. Andrews.

(15) *CALOCYCLUS ANNULARIS* Fabr.

Only one specimen taken, flying in the sunshine, on March 1st, 1906. Does not occur on Christmas Island.

(16) *RHOPICA HONESTA* Pasc.

(17) *RHOPICA BINOTATA* Gahan.

Both unique specimens. The genus is not represented on Christmas Island.

Seventeen species of beetles therefore occur on the Cocos-Keeling group, and only one—a cosmopolitan species—is definitely known to be also an inhabitant of Christmas Island, although the coleopterous fauna of that island embraces ninety-five species.

RHYNCHOTA.

By W. L. DISTANT, F.E.S.

Suborder HETEROPTERA.

Fam. PENTATOMIDÆ.

Subfam. CYDNINÆ.

(1) *GEOTOMUS PYGMÆUS*.

Æthus pygmeus Dall. List Hem. i. p. 120 (1851).

Geotomus pygmeus Sign. Ann. Soc. Ent. Fr. (6) iii. p. 51, t. iii. f. 160 (1883); Dist. Faun. B. I., Rhynch. i. p. 98, f. 49 (1902).

Hab. Widely distributed: recorded from Ceylon, Bombay, Burma, Andaman Islands, and generally distributed throughout the Malayan Archipelago; found in China and Japan, and recorded from New Caledonia and Hawaii.

Subfam. PENTATOMINÆ.

(2) *NEZARA VIRIDULA*.

Cimex viridula Linn. Syst. Nat. ed. 10, p. 444 (1758).

For full synonymy cf. Dist. Biol. Centr.-Am., Rhynch. i. p. 78 (1880).

This species is distributed throughout the Palearctic, Nearctic, and Ethiopian regions, and over a large portion of the Neotropical, Oriental, and Australian regions.

Subfam. ASOPINÆ.

(3) *OECHALIA CONSOCIALIS*.

Pentalatoma consocialis Boisd. Voy. Astrol., Ent. ii. p. 630, t. xi. f. 9 (1835).

Oechalia consocialis Stål, Enum. Hem. i. p. 59 (1870); Schont. in Wytsm. Gen. Insect., Fasc. 52, p. 75, t. v. f. 12 (1907).

This species is recorded from, and not uncommon in, Australia, New Zealand, and Tasmania. It is a well-known species in Queensland.

Fam. ARADIDÆ.

(4) BRACHYRHYNCHUS MEMBRANACEUS.

Aradus membranaceus Fabr. Syst. Rhyng. p. 118 (1803).

Brachyrhynchus membranaceus Stål, Hem. Fabr. i. p. 96 (1868); Dist. Faun. B. I., Rhyng. ii. p. 160 (1904).

Found throughout British India, Malay Peninsula, and Malayan Archipelago.

Fam. REDUVIIDÆ.

Subfam. NABIDINÆ.

(5) NABIS CAPSIFORMIS.

Nabis capsiformis Germ. in Selb. Rev. Ent. v. p. 132 (1837); Dist. Faun. B. I., Rhynch. ii. p. 400, f. 256 (1904).

Distributed in the Nearctic, Palearctic, Ethiopian, Oriental, and Australian Regions.

Fam. CAPSIDÆ.

(6) LYGUS sp. ?

Two specimens of a species of this widely distributed genus.

[None of these species can be described as at all abundant on the atoll, and only *Nezara viridula* is commonly met with; the others are, for the most part, very seldom found. The whole of the order collected on Christmas Island by Dr. Andrews was not worked over at the time of publication of his Monograph; but of the four species described by Mr. Kirby, there is not one that is common to Christmas Island and the Cocos-Keeling atoll. So far as I know, none of these species has earned a distinct native name, but the domestic representative of the family, which is common in native houses, is called "kutu basuk" = stinking insect.—F. W. J.]

Suborder HOMOPTERA.

Fam. FULGORIDÆ.

Subfam. RICANIINÆ.

(1) NOGODINA BOHEMANI.

Ricania bohemani Stål, Freg. Eugen. Resa, p. 280 (1858).

Nogodina bohemani Melich. Ann. Hofmus. Wien, xiii. p. 305, t. xiv. f. 9 a (1898).

Originally described from the Keeling Islands.

[This is not a common insect, and only a few examples were taken, all from the leaves of the Hibiscus trees on the seaward side of Pulu tikus.—F. W. J.]

NEUROPTERA.

Species determined by W. F. KIRBY, F.L.S., F.E.S.

ODONATA.

(Native family name, "Kachapong.")

(1) PANTULA FLAVESCENS Fabr.

A very abundant insect; it flies about all over the lagoon, and is present on all the islands. In April and May of 1906 the whole atoll swarmed with dragonflies, but for some time previous to that it had been very rare to meet with a single specimen. In the early months of 1905 these insects were entirely absent from the atoll.

(2) TRAMEA ROSENBERGII Brauer.

First seen on May 16th, 1906, and during the following week it became abundant; but for nearly a year previous to this it had not been seen, and its numbers soon diminished afterwards.

(3) ANAX GUTTATUS Burm.

This species also came first to the atoll in May 1906, and then only about a dozen examples were seen.

None of these species is resident on the atoll, and there is no open fresh water for them to pass their early stages in. All are wind-borne waifs, and do not belong properly to the fauna of the islands, although they are at times so conspicuous a feature of it.

Pantula flavescens appears to fly over the surface of the sea from choice, and not to be, by any means, an involuntary traveller; on the two occasions on which I have sailed from Java to the atoll, I have seen—on calm days—many dragonflies hawking about above the water. It is not easy to see what they are seeking, and yet they do not seem to be flying about merely at the sport of the wind. In November of 1906, whilst lying 20 miles to the south of the island of Sumbawa, these dragonflies were seen every day, during ten days of calm, to be flying in all directions over the surface of the sea, and as great numbers of butterflies and other insects were also to be seen, it is probable that they were in quest of food; any question of their being blown from the land was quite impossible. In 1907, during a spell of quite remarkable calm, dragonflies were seen on practically every day of a voyage between Sydney and Singapore.

On the atoll itself, *Tramea rosenbergii* was often seen to copulate, and apparently to deposit its eggs in the salt pools, but none of its larvæ could ever be found. *Pantula flavescens* and *Anax guttatus* are both visitors to Christmas Island.

PLANIPENNIA.

(4) HEMEROBIUS ? sp.

Native name, "Lalar ijou," = green fly.

This is a very abundant insect; it occurs on all the islands, and is certainly resident. When alive it is bright green, and its eyes are remarkably brilliant. On account of its very offensive smell when crushed, it is very well known. It is common at all seasons of the year.

(5) ISOPTERA.

Native name "Gegat."

One species of "white ant" is very abundant in the wood-work of dwelling houses. It is noteworthy that the natives never include this insect under the title of Samut,—the family name for ants.

ORTHOPTERA.

Species determined by W. F. KIRBY, F.L.S., F.E.S.

FORFICULIDÆ.

(1) ANISOLABIS ANNULIPES Luc.

A common species found upon all the islands. It does not occur on Christmas Island.

BLATTIDÆ.

(Native generic name, "Kerklak.")

(2) BLATELLA GERMANICA Linn.

(3) ALLACTA NOCTULATA Stål.

(4) ALLACTA OBTUSATA Brunn.

(5) LOBOPTERA sp.

(6) MOLYTRIA sp. (young larva).

(7) LEUCOPHŒA SURINAMENSIS Linn.

All these species are common, and are mostly found beneath the bark of trees, or in the dwelling-houses. Only *Leucophœa surinamensis* occurs on Christmas Island.

(8) PERIPLANETA AMERICANA Linn.

Common in store-houses; introduced by ships.

ACHETIDÆ.

(9) GRYLLODES SIGILLATUS Walk.

Native name, "Orong Orong."

Most commonly taken near to dwelling-houses; not very abundant.

(10) ORNEBIUS sp.

A very abundant species. It lives in the bushes of ironwood (*Cordia subcordata*), and passes its early stages in a rolled-up leaf. Neither of these species occurs on Christmas Island.

(11) GRILLACRIS sp. near *signifera* Stål.

Native name "Chingkrek."

This species also passes its early stages in the leaves of the *Cordia*. When adult it appears to be carnivorous; it has exceedingly powerful jaws, and is credited with waging war on the large centipedes. When put in a box with a centipede it certainly fights with great vigour, and though it bites the centipede, the fights that I have arranged ended fatally for the *Gryllacris*,—but I believe that this is by no means invariable. This species does not occur on Christmas Island, but the allied *G. rufovaria* takes its place. The antennæ are 150 mm. long.

(12) PHISIS PECTINATA Guer.

A fairly common species, usually found in the *Cordia* bushes. It is a bright green when living. It is not found on Christmas Island, but *P. listeri*, that occurs there, is very nearly allied to it.

(13) CONOCEPHALOIDES SOBRINUS Bol.

The male is buff-coloured, and the female green, during life. The species is abundant, and commonly lives in bushes. It is very musical. Does not occur on Christmas Island.

LOCUSTIDÆ.

(Native name, "Blalang blalang.")

(14) ACRYDIUM, sp. near *japonicum*, Sauss.

Very abundant on all the islands. Feeds on the fronds of the coconut palm. It varies greatly in size when adult, and is the subject of great seasonal changes of abundance and rarity.

It is not found on Christmas Island.

Although fourteen species of Orthoptera are found on the Cocos-Keeling atoll, and twenty-three occur on Christmas Island, there is only one species—*Leucophaea surinamensis*—that is common to both places. Of this species Dr. Andrews took only a single specimen.

ARACHNIDA AND MYRIAPODA.

By A. S. HIRST, F.Z.S.

The Arachnida collected by Dr. Wood Jones include several species which are well-known to be distributed through human agency. Of the few remaining forms, two spiders and one myriapod seem to belong to undescribed species, but it is probable that they will prove to be Malayan or East Indian forms which have been introduced through trade with these regions or have reached the islands by natural means.

SCORPIONS.

- (1)
- ISOMETRUS MACULATUS*
- De Geer.

Native name, "Klajingking."

Cosmopolitan.

SPIDERS.

(Native family name, "Laba laba.")

- (2)
- SMERINGOPUS ELONGATUS*
- Vinson.

Cosmopolitan.

- (3)
- PHYSOCYCLUS GLOBOSUS*
- Taczan Taczanowski.

Widely distributed in the tropical regions of the world.

- (4)
- NEPHILA IMPERATRIX*
- C. K.

An adult female example, which apparently belongs to this species, was collected by Dr. Wood Jones. It differs from Koch's description of the species in having the abdomen marked ventrally with two dark median patches, the anterior one being square and separated from the smaller posterior patch by a whitish line. The British Museum possesses examples of this form from Buitenzorg, Java, and from Australia (Keyserling Coll.)

- (5)
- HETEROPODA VENATORIA*
- Linn.

Cosmopolitan.

- (6)
- LYCOSA*
- n. sp.

- (7)
- BAVIA*
- n. sp.

MILLIPEDES.

(Native name, "Kaki ribu.")

- (8)
- TRIGONIULUS*
- n. sp.

- (9)
- ORTHOMORPHA COARCTATA*
- Saussure.

(10) There is also a large Centipede—native name "Alipan"—no specimen of which reached England.—F. W. J.

CRUSTACEA.

(Native family name, "Kapeting.")

The collection of this order was not at all a representative one, such specimens as were brought home have been determined by Dr. W. T. Calman, F.Z.S.

BRACHYURA.

- (1) *CARUPA LEVIUSCULA*.
- (2) *LEPTODIUS SANGUINEUS*.
- (3) *LIOXANTHO PUNCTATUS*.
- (4) *LIOMERA PUBESCENS*.
- (5) *ACTÆA FOSSULATA* ?
- (6) *CARPILIUS MACULATUS*.
- (7) *EURUPPELLIA ANNULIPES*.
- (8) *PSEUDOZIUS CAYSTRUS*.
- (9) *ERIPHIA LEVIMANA*.
- (10) *MELIA TESSELLATA*.
- (11) *GELASIMUS* sp.
- (12) *CARDISOMA HIRTIPES*.
- (13) *GECARCOIDEA LALANDEI*.
- (14) *LILOPHIUS PLANISSIMUS*.
- (15) *SCHIZOPHRYSS ASPERA*.
- (16) *CALAPPA HEPATICA*.

In addition to this list there are several members of the genus *Ocypoda* that live on the lagoon beaches, and several of the genus *Leptograpsus*, of which one, the native name of which is "Kapeting traieg," is eaten in the islands; a member of the genus *Geograpsus* is one of the common land species.

ANOMURA.

- (1) *REMIPES TESTUDINARIUS*.
- (2) *BIRGUS LATRO*.
- (3) *CÆNOBITA CLYPEATUS*.
- (4) *CÆNOBITA RUGOSUS*.
- (5) *CÆNOBITA PERLATUS*.
- (6) *CALCINUS HERBSTII*.
- (7) *CLIBANARIUS CORALLINUS*.

CARIDEA.

- (1) ALPHEUS STRENUUS.

STOMATOPODA.

- (1) GONODACTYLUS CHIRAGRA.

VERMES.

There is one species of earthworm found in all the islands, but unfortunately no specimen reached England.

2. Contributions to the Anatomy of certain Ungulata, including *Tapirus*, *Hyrax*, and *Antilocapra*. By FRANK E. BEDDARD, M.A., F.R.S., F.Z.S., Prosector to the Society.

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(Text-figures 10-19.)

I have during the past three or four years dissected and studied various organs in a number of Ungulate animals, to which group I have indeed paid special attention in view of the fact that for obvious reasons these mostly large animals have been comparatively little examined. Indeed, of two or three of the species of Antelopes to which I shall call attention in the following pages there is, so far as I am aware, absolutely no knowledge of the structure of certain of the soft parts. A good deal of work has been done upon this group lately by Dr. Einar Lönnberg, C.M.Z.S., and upon some of the genera with which I occupy myself in the following pages, viz., *Cephalophus*, *Madoqua*, and *Gazella*. I am able, however, to add something to the large number of facts which Dr. Lönnberg has accumulated in his various papers to which reference will be made in the proper places. The notes which I have to communicate to the Society may be arranged under the following headings, viz. :—

- (1) On the absence of a Pleural Cavity in the Indian Tapir, p. 161.
- (2) Notes upon the Brain and some other points in the Anatomy of *Hyrax*, p. 162.
- (3) On the Existence of a new Skeleto-visceral Muscle in the Pygmy Hog (*Porcula salvania*), p. 170.
- (4) Notes upon the Anatomy of the Prongbuck (*Antilocapra americana*), and on the Colic Helicine in some Artiodactyles, p. 172.
- (5) Some Notes upon the Anatomy of *Madoqua phillipsi*, p. 188.
- (6) The Brain of *Babyrussa alfurus*, p. 192.
- (7) Résumé of new facts, p. 196.